

## Ocean and Weather

**Essential Question:** How does the ocean affect climate and weather on land?

**Ocean currents act as conveyer belts of warm and cold water**, sending heat toward the polar regions and helping tropical areas cool off. The world's ocean is **crucial to heating the planet**. While land areas and the atmosphere absorb some sunlight, the majority of the sun's radiation is absorbed by the ocean. Particularly in the tropical waters around the equator, the ocean acts as a massive, heat-retaining solar panel. **Earth's atmosphere** also plays a part in this process, helping to retain heat that would otherwise quickly radiate into space after sunset.

The ocean doesn't just store solar radiation; it also helps to distribute heat around the globe through **the global ocean current**. When water molecules are heated, they exchange freely with the air in a process called **evaporation**, this results to the **water cycle**. Ocean water is constantly evaporating, increasing the temperature and humidity of the surrounding air to form **rain and storms** that are then carried by **trade winds**, often vast distances. In fact, almost all rain that falls on land starts off in the ocean. The **tropics** are particularly rainy because of high heat absorption, and thus ocean evaporation, is highest in this area.

Outside of Earth's equatorial areas, weather patterns are driven largely by ocean currents. **Ocean Currents** are movements of ocean water in a continuous flow, created largely by **surface winds** but also partly by **temperature and salinity gradients**, **Earth's rotation**, and **tides** (rising water due the gravitational effects of the sun and moon). Major current systems typically flow **clockwise in the northern hemisphere** and **counterclockwise in the southern hemisphere**, in circular patterns that often trace the coastlines.

**Ocean currents** act much like a **conveyer belt, transporting warm water and precipitation from the equator toward the poles and cold water from the poles back to the tropics**. Thus, **ocean currents regulate global climate**, helping to counteract the uneven distribution of solar radiation reaching Earth's surface. Without currents, regional temperatures would be more extreme—super hot at the equator and frigid toward the poles—and much less of Earth's land would be habitable.

### Four Factors that Influence Weather

1. **The Water Cycle:** As the sun warms the surface of the Earth, water rises in the form of water vapor from oceans, lakes, rivers, plants, the ground, and other sources. This process is called **evaporation**. Water vapor **condenses** into clouds and eventually returns to Earth in the form of **precipitation**, and the cycle continues.

2. **Air Masses:** **Air masses take on the characteristics of the area below them**. Air masses that form over water are humid or wet, air masses that form over land are dry, air masses the form near the equator are warm, and air masses that form near poles are cold. Warm air masses carry more water vapor that cold air masses.

3. **Weather Fronts:** The area where air masses meet is called the **weather front**. The four types of weather fronts are **cold front, warm front, stationary front, and stationary front**. Weather changes happens where the air masses meet. Cold fronts are the fastest and they usually result to cumulonimbus clouds and thunderstorm, even tornadoes! Stationary fronts are almost not moving and they result to persistent weather. Warm fronts result to light precipitation.

4. **Jet Stream:** A jet stream is the name given to the area of air above where two air masses of different temperature converge e.g. a cold front meeting a warm front. The greater the temperature difference between the air masses, the greater the air pressure difference, and the faster the wind blows in the jet stream. This river of air has wind speeds which often exceed 100 mph, and sometimes over 200 mph. Jet streams more commonly form in the winter, when there is a greater difference between the temperature of the cold continental air masses and warm oceanic air masses. This meandering current of high-speed wind, a jet stream is usually found around five to ten miles above Earth's surface. Jet Streams generally flows from west to east.

**Reading Comprehension Questions:**

1. Explain the meaning of “conveyor belt” in the second sentence. **Think!** \_\_\_\_\_

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2. How do the oceans cool the tropical areas?

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3. Why are the world oceans crucial to heating and warming the planet? \_\_\_\_\_

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4. Why do the tropical waters absorb more heat than the polar waters? **Think!**

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5. Aside from the oceans, what else retains the heat on Earth? \_\_\_\_\_

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6. What do you think will happen on Earth’s temperature if we do not have the oceans? **Clue! The beach sand is very hot on a sunny day but the wind is cool.** \_\_\_\_\_

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7. How do the oceans distribute heat around the globe? \_\_\_\_\_

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8. What happens to water molecules when they are heated? \_\_\_\_\_

9. Water that rises into the air turns into clouds through the process of \_\_\_\_\_

10. Rain storms are usually carried by \_\_\_\_\_ winds.

11. Why do tropical areas receive more rain? \_\_\_\_\_

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12. What are ocean currents? \_\_\_\_\_

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13. What are the factors that create ocean currents? \_\_\_\_\_

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14. What are tides? \_\_\_\_\_

15. What is the direction of the ocean current in the northern hemisphere? \_\_\_\_\_

16. What is the direction of the ocean current in the southern hemisphere? \_\_\_\_\_

17. How do the ocean currents regulate the global climate? \_\_\_\_\_

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18. What will happen if there are no ocean currents? \_\_\_\_\_

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19. What are the four factors that influence the weather? \_\_\_\_\_

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20. Matching type:

\_\_\_\_\_ Water cycle

\_\_\_\_\_ Jet Stream

\_\_\_\_\_ Weather fronts

\_\_\_\_\_ Air masses

\_\_\_\_\_ Cold front

\_\_\_\_\_ Dry air mass

\_\_\_\_\_ Polar/cold air mass

a. cold front, warm front, occluded front, stationary front

b. high speed wind that flows from west to east

c. evaporation, condensation, precipitation

d. they take on the characteristics of the area below them

e. cumulonimbus clouds, thunderstorms, even tornadoes!

f. air mass that formed over land

g. air mass that formed over Canada